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electrochemical equivalent of silver by Patterson and Guthe,\* under a grant from the American Association, brings Griffiths' value for the mechanical equivalent of heat into coincidence with Rowland's value. This work of Patterson and Guthe is of the greatest importance and is greatly to the credit of the American Association Committee on Standards of Measurement.

W. S. F.

#### CURRENT NOTES ON METEOROLOGY.

##### PAPAGUERIA.

SINGULARLY emphatic is the control exercised by the climatic conditions in the arid region of southern Arizona over the animal and vegetable life that is found there, as is shown by McGee in a recent article on 'Papagueria' (*National Geographic Magazine*, August). The district inhabited by the Papago Indians, south of the Gila river and southwest of the Sierra Madre and bounded on the southwest by the Gulf of California, is extremely arid. The scanty vegetation is fitted for its peculiarly difficult struggle for existence by being pulpy in structure and having impervious rinds for preserving moisture, as well as by being provided with thorns. The animals are armed with mandibles, stings, poison glands and other protective devices. In order to carry on the struggle for existence as successfully as possible, animal and vegetable life associates itself in communities, where grasses, trees, cacti, insects, reptiles, birds and mammals live together in harmony and mutual coöperation. The most interesting control of the climate is naturally that over man. The keynote to the understanding of the life and habits of the Papago Indians is to be found in the climatic conditions. The semi-nomadic life of the greater portion of the tribe; the building of their rude huts in the vicinity of permanent or temporary

springs; the absolute dependence of the times of planting and of harvesting upon the storms or freshets; the migrations southward and northward with the coming on of summer or winter—in these and in many other ways climate is seen to be the great control in the life of the people. As the writer strongly emphasizes at the conclusion of his extremely interesting paper, "the life of the Papago is a round of migrations and wanderings, largely in search of the means of subsistence, of which the first and the second and the third are water, *water*, WATER—water to alleviate his own thirst in the sun-parched deserts, water to sustain his horses and burros and kine, water to vivify the plants of which man and his creatures eat."

##### TREE PLANTING ON THE PLAINS.

A NUMBER of points of meteorological interest are found in Bulletin No. 18 of the Division of Forestry, entitled 'Experimental Tree Planting in the Plains,' by Charles A. Keffer, Assistant Chief of the Division. The experimental tree plantings described in this report were begun in 1896, in South Dakota, Nebraska, Kansas, Colorado, Minnesota and Utah. Protection, then amelioration of climate, is the principal object of the plantings, a wood supply being a secondary consideration, for the growing of timber on a commercial scale on the Plains is hardly to be expected. That a lack of sufficient moisture is the cause of the treelessness of the Plains has often been claimed, but many artificial plantings are now growing successfully in what was a few years ago a treeless region. A study of the climatic and soil conditions, and the results of the experiments, lead to the conclusion that the line of successful tree culture will move westward as the agricultural development of the country goes on, and as the soil is more and more broken up and disintegrated. The preva-

\*Reported to Section B at the Boston Meeting.

lence of winds in the region of the Plains is hostile to agriculture, by reason of the increased transpiration from vegetation and the evaporation from the soil thereby produced; and trees planted in masses or large groves, in selected locations, form excellent wind-breaks and protect the crops for some distance to leeward of them. The Bulletin contains full descriptions of the various experimental plantings and is well illustrated.

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#### BACTERIOLOGICAL NOTES.

THE bearing of optical aids upon the growth of our knowledge of disease-producing germs is well illustrated by two contributions recently made to the Ninth International Congress of Hygiene and Demography, held at Madrid. The work of Loeffler and Frosch on the ætiology of foot and mouth disease in cattle was reported. The disease-germ of this disease is so small that it passes, contained within the lymph, through Berkefeld filters that hold back the smallest known microorganisms. This germ is thus far known by its effects only, for the highest power of the microscope fails to disclose anything in the filtered lymph, which is yet capable of setting up the disease upon inoculation. That the disease does not depend upon some soluble toxic agent contained within the lymph is proved by the fact that the disease has been transmitted through a series of six animals, the original material, which was employed for the first inoculation, having been obtained from a case of the natural disease. In each successive inoculation the lymph was filtered. We know of no toxic substance so potent, nor, indeed, is it probable that anything but a living and multiplying organism could be so active as to be transmissible through such a number of cattle, each one of which succumbs in turn to the

disease produced. These authors do not even conjecture as to the probable character of the microorganism concerned.

The microorganism of infectious pleuropneumonia of cattle has also been sought by many bacteriologists. It has just been obtained by Nocard and Roux. The lymph taken from the affected lungs is highly infectious and readily produces the disease in cattle upon inoculation. Cultures made with this material had always remained sterile, and most painstaking search had failed to reveal any foreign elements in the lymph. By a novel procedure, first introduced by Metschnikoff, Nocard and Roux succeeded in obtaining cultures of the microorganism. If small sacs (or bladders) made of celloidin are filled with sterile bouillon and placed in the peritoneal cavity of the rabbit they undergo no change, the fluid remains clear and limpid, and the animal is unaffected. If, however, a minute quantity of the lymph from an infected lung is introduced into the sac, after a period the bouillon becomes opalescent. Transplantation from one sac to another brings about similar results. Microscopical examination of the turbid fluid shows an entire absence of wandering or other body cells, but a magnification of 1,600 to 1,800 times brings to light very minute round or elongated bodies which are believed to be the parasites of the disease. After the sacs have remained for a time in the abdominal cavity of the rabbit these animals lose weight and become cachetic. Albumen probably diffuses into the sacs and toxic substances into the peritoneal cavity. These cultures are exceedingly active and produce the typical disease upon inoculation. At first all attempts to cultivate this minute organism outside the body failed, but later through the use of a special culture medium success was achieved.

It is safe to assume that the parasite of foot and mouth disease is much smaller